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Numerical simulation of cavitating channel flows including non-condensable gases effects MICHELE BATTISTONI[1], SIBENDU SOM, DOUGLAS E. LONGMAN, Argonne National Laboratory, Chicago IL — Fuel injectors often feature cavitation because of large pressure gradients which in some regions lead to extremely low pressure levels. Numerical results are assessed against quantitative high resolution experimental data collected at Argonne National Laboratory using synchrotron x-ray radiography on real-size fuel nozzles. Simulation are performed on structured embedded grids using finite volume method and second-order discretization schemes in space and time. A single fluid homogeneous mixture model is compared to a multi-fluid non-homogeneous model. Two mass transfer models for predicting cavitation are also studied. RANS and LES cases are presented. The presence of dissolved gases in the multi-phase flow is addressed and their effect has been accounted for by running compressible three-phase flow simulations. The study highlights the importance of accounting for dissolved gases in the liquid, since some void formations, which could be attributed to cavitation, are actually due to non-condensable gas expansion. A discussion about the effect of turbulent pressure fluctuations on cavitation inception is also presented.

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